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10/799,296

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Stephen L. James

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EXAMINER

HA, NATHAN W

ART UNIT

PAPER NUMBER

2814

| SHORTENED STATUTORY PERIOD OF RESPONSE | NOTIFICATION DATE | DELIVERY MODE |
|--|-------------------|---------------|
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3 MONTHS

01/30/2007

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Notice of this Office communication was sent electronically on the above-indicated "Notification Date" and has a shortened statutory period for reply of 3 MONTHS from 01/30/2007.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary

Application No.

10/799,296

Applicant(s)

JAMES ET AL.

Examiner

Nathan W. Ha

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 November 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 87-157 is/are pending in the application.

4a) Of the above claim(s) 91,96-102,105-107,112-121,124,128-133,152, and 153 is/are withdrawn from consideration.

- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 87-90,92-95,104,108,122,123,125-127 and 134-157 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 10/06

- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 102

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

1. Claims 87-90, 108, 111, 122-123, 135-137, 140-141, 146-148, 149-151, and 154-157 are rejected under 35 U.S.C. 102(e) as being anticipated by Houle (US 2004/0095727, previously cited.)

In regard to claims 87, 89, 122, 140, 148, 151, and 154-157, in fig. 3a, Houle discloses a method of fabricating a semiconductor device, comprising the steps of:

providing a support substrate 307a having a first surface and a second surface, each surface having terminal pads located thereon, at location 308a;

providing a semiconductor die 304a having a first surface with at least one standoff 302a attached thereto, and a second surface, the at least one standoff being exposed and formed on only part of the first surface of the die; and

mounting the second surface of the die on the first surface of the substrate.

In regard to claims 88 and 111, wherein the die is flip chip mounted on the support substrate. See also, fig. 3a and paragraph [0027].

In regard to claims 90 and 123, Houle further discloses that wherein the step of forming the standoff comprises dispensing a material on the surface of the die by a method selected from the group consisting of stamping. See [0027].

In regard to claim 108, wherein the standoff is in the form of an enclosure, and the method further comprises disposing a heat sink material 305a and 306a on the surface of the die within the standoff enclosure. See fig. 3a and [0030].

In regard to claim 112, see the discussion of claim 87.

In regard to claim 135, Houle further discloses the step of forming ball contacts 308a on a second surface of the die. See fig. 3a.

In regard 136, Houle further comprising mounting the die on a support substrate 307a.

In regard to claim 137, please see the above discussions regarding to claims 87 and 108.

In regard to claims 141 and 143, wherein the support substrate is a flexible substrate.

In regard to claim 146, Houle further discloses forming external contacts 308a on a second surface of the support substrate. See fig. 3a.

In regard to claim 147, the external contacts are mounted on the support substrate substrate.

In regard to claim 149, the whole package is being encapsulated. See fig. 3a.

In regard to claim 150, Houle further comprises forming external contacts 403a on the second surface of the support substrate. See fig. 4a.

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 87-90 and 92-94 are rejected under 35 U.S.C. 102(b) as being anticipated by Chiu (US 2003/0183909.)

In regard to claims 87 and 89, in figs. 4-6, Chiu discloses a method of fabricating a semiconductor device, comprising steps of:

providing a support substrate 108 having a first surface and a second surface, each surface having terminal pads at the opposite sides of elements 116 located thereon;

providing a semiconductor die 102 having a first surface with at least one standoff, or spacer 154 attached thereto, and a second surface, the at least one standoff being exposed and formed on only part of the first surface of the die; and

mounting the second surface of the die on the first surface of the substrate.

In regard to claims 88 and 111, Chiu discloses wherein the die is flip chip mounted on the support substrate. See also paragraph [0025].

In regard to claim 90, Chiu further discloses wherein the step of forming the standoff, spacer, comprises dispensing a material on the surface of the die by a method selected from the group consisting of direct spreading, or coating. See also [0029].

In regard to claims 92-93, Chiu further mentioned the materials of the standoff, spacer. These materials are in solid state at room temperature. It is described in [0029-0030] that the material is at its liquid state during the dispensing process, and using capillary.

In regard to claim 94, the material is a curable polymeric material, polymer, for example. See also [0030].

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 109-110 and 138-139 are rejected under 35 U.S.C. 103(a) as being unpatentable over Houle as applied to claims 87-89 and 137 above.

In regard to claims 109-110, Houle discloses all of the claimed limitations as addressed above. Houle further teaches the particular heat sink material contains metal particles (see paragraph [0030].) Houle, however, does not expressly teach that these particles are in fact copper or aluminum. Metals such as copper and aluminum are widely used as heat dissipation in semiconductor package for their well know physical and chemical property such highly conductive, and also widely available, or cost effective. For instance, in the same device, Houle further suggests that heat spreader may be formed by using copper or aluminum. See paragraphs [0027-0028].

Therefore, it would have been obvious to one of ordinary skill in the art to substitute the materials as taught in order to provide a better heat spreader device.

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6. Claims 92-95, 104, 125-127, and 134 are rejected under 35 U.S.C. 103(a) as being unpatentable over Houle as applied to claims 87-90 and 122 above, and further in view of Dolbear (US 5,926,371, previously cited.)

In regard to claims 92-95, 104, and 134, Houle discloses all of the claimed limitations as mentioned above. As also further mentioned, Houle suggests that the standoffs may be formed by several ways such injection molding (see paragraph [0027]). This suggestion hints that the material of the injected material could have been resin since resin a widely used material in semiconductor packaging, and since resin can be easily harden, or curable, after the injection process; therefore, providing protection to the device.

For instance, Dolbear, in fig. 3, discloses an analogous semiconductor package including support substrate 38, chip 40, and standoffs 58a-58c. The standoffs further are made of epoxy adhesive, or resin, or plastic, by a similar method as disclosed by the current invention, molding injection, dispensing, etc. See also, col. 11, line 58 to col. 12, line 20.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to recognize resin as a well known and commonly used in the art as taught by Dolbear, and in order to take the advantage as mentioned.

In regard to claims 125 and 127, as mentioned in claim 95, the material should be in liquid form in order to perform the injection process, or dispensing process, then harden the material to form a protection around the device.

Therefore, it would be obvious to realize the processes can only be carried out with the material in a liquid form, and so the material can be dispensed uniformly over the substrate, or the device.

7. Claims 142-145 are rejected under 35 U.S.C. 103(a) as being unpatentable over Houle as applied to claim 140 above, and further in view of Sylvester et al. (US 6,847,527, previously cited, hereinafter, Sylvester.)

In regard to claims 142-145, Houle discloses all of the claimed limitations as mentioned above. Houle further teaches the device is formed on the substrate. However, Houle does not expressly describe the material of the substrate as claimed in claims 142-145. It should be further noted that package substrate is normally called as printed circuit substrate, or PCB. This PCB is commonly made by ceramic, resin, polymer material, etc. These materials can sustain high temperature and have high level of flexibility, which prevent warping that happens due to thermal coefficient mismatch among the devices. For instance, Sylvester discloses an analogous package and further describes the details of the substrate 58, which comprises polymer material such as polyimide film, epoxy resin. See also entire col. 5.

Therefore, it would be obvious to one of skilled artisan in the art to use the substrate as taught by Sylvester in order to take the advantage as mentioned.

Response to Arguments

8. Applicant's arguments filed 11/13/06 have been fully considered but they are not persuasive. For instance, the Applicants argue that the cited reference, Houle, does not

disclose that the standoff is formed on the surface of the die. Houle indeed discloses standoffs or spacers 302a directly formed on the backside of the die 304a. It should be noted that the backside is also considered a surface of the die. For example, figure 3a of Houle is substantially identical with the current invention fig. 1, where the standoffs are formed on the back surface of the die.

9. Applicants further argue that the Houle does not disclose that the standoffs are formed in a form of an enclosure with heatsink material formed within. Again, figure 2A shows the cross section of the device where standoffs are on the sides and other materials are formed inside. This figure suggests that the standoffs indeed are formed in an enclosure form and heatsink material is formed in side.

10. Applicants further argue that Dolbear does not disclose that the resin is formed by dispensing a flowable material. However, Applicants recognize that Dolbear indeed using dispensing step. This step is only possible when the material is flowable.

11. It is further noted that Houle indeed shows standoffs are formed on the surface of the die 304 in fig. 3A.

Conclusion

12. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

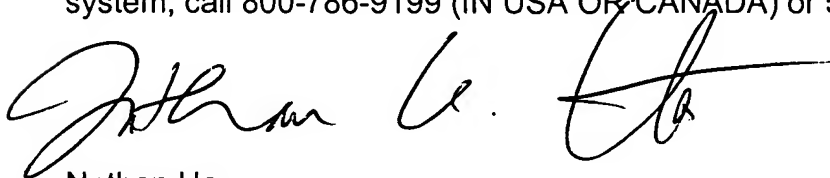
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mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nathan W. Ha whose telephone number is (571) 272-1707. The examiner can normally be reached on M-TH 8:00-7:00(EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

A handwritten signature in black ink, appearing to read 'Nathan W. Ha', with a stylized flourish at the end.

Nathan Ha

Primary Examiner